AMENDMENTS TO THE CLAIMS

Please cancel claims 21-25 without prejudice to pursue these claims in a continuation

application, amend claims 17, 50, 51, 54, 59, 85, and 87, and insert new claims 96-109, as follows:

1.   (Allowed) A method of gating radiation for a computed tomography procedure, comprising:

measuring a first set of signal data representative of a physiological movement of a patient

during a first time period;

pattern matching the first set of signal data with a second set of signal data related to

measured physiological movement of a patient during a second time period to identify degree of

deviation from periodicity of the physiological movement; and

gating radiation to the patient if the degree of deviation from periodicity exceeds a threshold

based upon results of the pattern matching.

2.   (Allowed) The method of claim 1 in which the first set of signal data and the second set of

signal data are pattern matched using an autocorrelation function.

3.   (Allowed) The method of claim 1 in which the first set of signal data and the second set of

signal data are pattern matched using an absolute difference function.

4.   (Allowed) The method of claim 1 further comprising:

determining a degree of match between the first set of signal data and the second set of signal data.

5.   (Allowed) The method of claim 4 in which the degree of match is determined by a secondary peak value of an autocorrelation function.

6.   (Allowed) The method of claim 4 in which the degree of match is determined by a secondary minimum value of an absolute difference function.

7.   (Allowed) The method of claim 4 further comprising:

comparing the degree of match to a threshold range.

8.   (Allowed) The method of claim 7 in which the degree of match outside the threshold range indicates deviation from a normal physiological movement.

9.   (Allowed) The method of claim 7 in which the degree of match within the threshold range indicates a repetitive physiological movement.

10.   (Allowed) The method of claim 9 in which a point of best match indicates a period of the physiological movement.

11.   (Allowed) The method of claim 1 further comprising:

predicting a period of the physiological movement during a third time period.

12.   (Allowed) The method of claim 11 further comprising:

predictively actuating a gating system component based upon the predicted period.

13.   (Allowed) The method of claim 1 further comprising:

determining a period of the physiological movement.

14.   (Allowed) The method of claim 13 further comprising:

defining a treatment interval to apply radiation to a patient.

15.   (Allowed) The method of claim 14 in which the treatment interval is defined by phase of the

physiological movement.

16.   (Allowed) The method of claim 1 in which the second set of signal data is a data model of

the physiological movement of the patient.

17.   (Currently Amended) A method for physiological gating an execution of a procedure

comprising:

determining a period of physiological movement;

physiological gating an execution of a procedure in an interval range based upon phase of the

period of a variable, the variable representative of a degree of completion of a cycle of the

physiological movement.

18.   (Original) The method of claim 17 in which the period of physiological movement is determined by pattern matching a first set of data representative of the physiological movement during a first time period with a second set of data related to the physiological movement during a second time period.

19.   (Original) The method of claim 18 in which the first set of data and the second set of data are pattern matched using an autocorrelation function.

20.   (Original) The method of claim 18 in which the first set of data and the second set of data are pattern matched using an absolute difference function.

21-25. (Canceled)

26.   (Allowed) A method of gating the application of radiation for a CT procedure, comprising:

measuring signal data representative of at least a portion of a physiological movement to form a set of ordered measurement samples;

pattern matching the set of ordered measurement samples against prior measurement samples of the physiological movement to determine deviation from periodicity of the set of ordered measurement samples; and

gating CT radiation to the patient if the deviation from periodicity is outside a threshold range.

27.   (Allowed) The method of claim 26 in which the second set of ordered measurement samples overlaps with the prior measurement samples.

28.   (Allowed) The method of claim 26 in which the step of pattern matching comprises shifting the set of ordered measurement samples against the prior measurement samples at a plurality of offset sample positions to determine position of best match.

29.   (Allowed) The method of claim 28 in which an absolute difference function is used to determine the position of best match.

30.   (Allowed) The method of claim 26 further comprising:

determining a predicted value for an additional measurement sample for the physiological movement.

31.   (Allowed) The method of claim 30 in which radiation gating occurs if the predicted value deviates from the additional measurement sample beyond a designated threshold level.

32.   (Allowed) The method of claim 28 in which a search range for position of best match is established based upon a predicted position, in which the predicted position is based upon a period established from the prior measurement samples.

33.   (Allowed) The method of claim 26 in which the physiological movement comprises breathing movement.

34.   (Allowed) The method of claim 26 in which pattern matching is performed using an autocorrelation function.

35.   (Allowed) The method of claim 26 in which pattern matching is performed using an absolute difference function.

36.   (Allowed) The method of claim 26 further comprising;

defining an interval range to apply radiation to a patient.

37.   (Allowed) The method of claim 36 in which the interval range is defined based upon phase of the physiological movement.

38.   (Allowed) A method of gating radiation, comprising:

receiving a set of signal data representative of a physiological movement of a patient;

estimating phase of the set of signal data;

comparing a vector of the set of signal data with one or more prior sets of signal data to identify deviation from periodicity of the physiological movement, the vector of the set of signal data based upon the phase, the one or more prior sets relating to measured physiological movement of a patient during one or more prior time periods; and

gating radiation to the patient if the deviation from periodicity is identified.

39.   (Allowed) The method of claim 38 in which the phase is estimated by calculating period of the set of signal data.

40.   (Allowed) The method of claim 39 further comprising:

computing an inner product of a Cosine waveform with the period T and most recent T-seconds-long segment of the signal data to form an in-phase component;

computing the inner product with a sine waveform of the period T to form a quadrature component; and

computing the inverse Tangent of result of dividing the quadrature component by the in-phase component to estimate the phase.

41.   (Allowed) The method of claim 39 further comprising:

identifying an assumption for the period;

estimate location values for maximum and minimum values; and

based upon one or more sample sets, estimating the period.

42.   (Allowed) The method of claim 38 in which the vector comprises amplitude and phase components.

43.   (Allowed) The method of claim 38 in which the act of comparing the vector of the set of signal data with the one or more prior sets of signal data to identify deviation from periodicity of the physiological movement comprises:

using a 2-dimensional histogram array of signal versus phase values.

44. (Allowed) The method of claim 43 in which the 2-dimensional histogram array is accumulated during prior recordings of the physiological movement.

45. (Allowed) The method of claim 43 further comprising:

comparing the vector against with other values in the 2-dimensional histogram array;

forming a clustering factor; and

identifying deviation from periodicity if clustering factor exceeds a threshold.

46. (Allowed) The method of claim 38 in which the physiological movement comprises respiration activity.

47. (Allowed) The method of claim 46 further comprising:

estimating latest inhale values, latest exhale extreme values, and corresponding time points.

48. (Allowed) The method of claim 38 in which the radiation comprises therapeutic radiation.

49. (Allowed) The method of claim 38 in which the radiation relates to a CT procedure.

50. (Currently Amended) A method for gating an execution of a medical procedure, comprising:

collecting data samples for a physiological activity movement;

analyzing the data samples to identify deviation from periodicity; and

gating an execution of the medical procedure if deviation from periodicity is identified.

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51. (Currently Amended) The method of claim 50 in which the act of gating the <u>execution of the</u> medical procedure comprises gating the application of radiation.

52. (Original) The method of claim 51 in which the medical procedure comprises a computed tomography procedure.

53. (Original) The method of claim 51 in which the medical procedure comprises a radiotherapy procedure.

54. (Currently Amended) The method of claim 50 in which the act of gating the <u>execution of the</u> medical procedure comprises gating of data acquisition.

55. (Original) The method of claim 54 in which gating of data acquisition comprises binning data.

56. (Original) The method of claim 54 in which the medical procedure comprises an emission imaging method.

57. (Original) The method of claim 56 in which the emission imaging method comprises an MRI procedure.

58. (Original) The method of claim 56 in which the emission imaging method comprises a PET procedure.

59. (Currently Amended) The method of claim 50 in which gating is performed ~~retrospectively~~ not in real-time.

60-79. (Previously Canceled)

80. (Previously Added) The method of claim 59, wherein the medical procedure comprises reconstructing an image.

81. (Previously Added) The method of claim 80, wherein the reconstructing comprises using data collected from a computed tomography procedure.

82. (Previously Added) The method of claim 80, wherein the reconstructing comprises using data collected from an MRI procedure.

83. (Previously Added) The method of claim 80, wherein the reconstructing comprises using data collected from a PET procedure.

84. (Previously Added) The method of claim 80, wherein the reconstructing comprises generating a volumetric image.

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85. (Currently Amended) The method of claim 80, wherein the analyzing comprises determining an amplitude of ~~the~~ a physiological movement of the patient.

86. (Previously Added) The method of claim 80, wherein the gating the medical procedure comprises

synchronizing the data samples and acquired image data to a common time base;

identifying an interval of interest; and

generating an image using image data associated with the interval of interest.

87. (Currently Amended) A method for ~~gating a medical procedure~~ generating an image, comprising:

collecting data samples representative of a physiological movement of a patient due to breathing;

acquiring image data of at least a part of the patient over a time interval;

synchronizing the data samples and the image data to a common time base;

~~analyzing the data samples to identify~~ identifying an interval of interest based on one or more of the data samples; and

generating an image using at least a portion of the image data associated with the interval of interest.

88. (Previously Added) The method of claim 87, further comprising associating the data samples that correspond to the interval of interest with corresponding image data.

89.   (Previously Added) The method of claim 87, wherein the generating comprises performing a computed tomography procedure.

90.   (Previously Added) The method of claim 87, wherein the generating comprises performing an MRI procedure.

91.   (Previously Added) The method of claim 87, wherein the generating comprises performing a PET procedure.

92.   (Previously Added) The method of claim 87, wherein the time interval comprises at least one physiological cyclic interval.

93.   (Previously Added) The method of claim 87, wherein the generating comprises constructing a volumetric image.

94.   (Previously Added) The method of claim 87, wherein the analyzing comprises determining an amplitude of the physiological movement of the patient.

95.   (Previously Added) The method of claim 92, wherein the one physiological cyclic interval comprises one interval within a physiological breathing cycle.

96.   (New) A method for generating an image, comprising:

using an optical device to collect data samples representative of a physiological movement of a patient;

acquiring image data of at least a part of the patient over a time interval;

synchronizing the data samples and the image data to a common time base;

analyzing the data samples to identify an interval of interest; and

generating an image using image data associated with the interval of interest.

97.   (New) The method of claim 96, further comprising associating the data samples that correspond to the interval of interest with corresponding image data.

98.   (New) The method of claim 96, wherein the generating comprises performing a computed tomography procedure.

99.   (New) The method of claim 96, wherein the generating comprises performing an MRI procedure.

100.   (New) The method of claim 96, wherein the generating comprises performing a PET procedure.

101.   (New) The method of claim 96, wherein the time interval comprises at least one physiological cyclic interval.

102.   (New) The method of claim 96, wherein the generating comprises constructing a volumetric image.

103.   (New) The method of claim 96, wherein the analyzing comprises determining an amplitude of the physiological movement of the patient.

104.   (New) The method of claim 101, wherein the one physiological cyclic interval comprises one interval within a physiological breathing cycle.

105.   (New) The method of claim 96, wherein the physiological movement is associated with a heart motion.

106.   (New) The method of claim 96, wherein the physiological movement is associated with a breathing motion.

107   (New) The method of claim 96, wherein the optical device comprises a camera.

108.   (New) The method of claim 87, wherein the generating an image comprises displaying the image using image data generated within the interval of interest.

109.   (New) The method of claim 108, wherein the image comprises a fluoroscopic image.